USDA

United States
Department of
Agriculture

**Forest
Service**

Pacific
Southwest
Region

R5-MB-000
May 2012

Environmental Assessment for

Indian Valley Restoration Project

Eldorado National Forest

Background

Indian Valley is located adjacent to the Mokelumne Wilderness, about 9 miles southwest of Carson Pass and Highway 88 (see map attached, Figure 1). The specific project location is in the Indian Valley watershed, a tributary of Deer Creek of the greater North Fork Mokelumne River watershed (T9N, R19E, S34). The goal of the Indian Valley Restoration Project is to restore high mountain meadow habitat within Indian Valley. This project would improve and increase habitat available for Sierra Nevada yellow-legged frogs and Yosemite toads, enhance and expand willow habitat for songbirds (including the willow flycatcher), create habitat for possible use by sensitive mosses (Meesia triquetra and M. uliginosa), moonworts (Botrychium spp.) and sensitive subalpine fireweed (Epilobium howellii), and increase the production of aquatic invertebrates and insects that provide food for amphibians, songbirds, and trout downstream. The project should increase storage of snowmelt groundwater (baseflow) for late summer wetting of meadow vegetation and release water downstream at higher levels later in the season than at the present time. The ambient temperature of 500 acres of meadow is expected to be lowered by approximately 3 degrees C (Loheide and Gorelick 2006), and probably double the evapotranspiration rates as a result of increased surface water (Loheide and Gorelick 2005; Waring and Schlesinger, 1985).

Purpose and Need

There is a need to improve meadow ecosystem function.

Indian Valley is a sensitive high-elevation meadow in degraded condition. The state of the meadow today is a result of past human activities and natural processes. The degraded condition is described as: stream channel erosion with gullying and headcutting, lowering of the ground water table in the meadow, drying of the meadow vegetation, loss of willows, sagebrush encroachment, and sedimentation in the stream channel.

The desired condition for meadows is to be hydrologically functional. Sites of accelerated erosion, such as gullies, and head cuts are stabilized and recovering. Vegetation roots occur throughout the available soil profile. Meadows with perennial streams have the following characteristics: 1) stream energy from high flows is dissipated, reducing erosion and improving water quality, 2) streams filter sediment and capture bedload, aiding floodplain development, 3) meadow conditions enhance floodwater retention and groundwater recharge, and 4) root masses stabilize stream banks against cutting action. (2004 SNFPA ROD pages 42-43).

There is a need to improve meadow ecosystem function in Indian Valley..

There is a need to maintain and enhance plant and wildlife habitat.

Indian Valley currently has a population of Sierra Nevada yellow legged frogs, possible hybrid Yosemite toads and western toads, and willow flycatcher have been located nesting in the valley and at the nearby Wet Meadows Reservoir. These species are Region 5, USDA FS sensitive species.

A desired condition for riparian conservation areas is for habitat to support viable populations of native and desired non-native plant, invertebrate, and vertebrate riparian-dependent species (2004 SNFPA ROD page 42).

There is a need to maintain habitat for existing populations of aquatic species in Indian Valley as well as enhance habitat for future populations.

There is a need to continue to provide a clean and consistent water supply for human use in various forms.

Water within the meadow in Indian Valley flows into Deer Creek and eventually flows into the North Fork of the Mokelumne River. The North Fork of the Mokelumne River provides recreational opportunities, feeds hydroelectric plants (Salt Springs Reservoir), and provides drinking water to the San Francisco Bay area. A desired condition for the riparian conservation areas is for water quality to meet the goals of the Clean Water Act and Safe Drinking Water Act. Specifically, the water is fishable, swimmable, and suitable for drinking after normal treatment.

Public Involvement

A brief description of location and type of project was included in the Eldorado National Forest Schedule of Proposed Actions (SOPA) each quarter since July 2007.

The scoping letter was mailed or emailed, April 2008 out to adjacent property owners, state and local agencies, local interested groups, and interested individuals. The letter contained the detailed proposed action, map, and methods for participation. Eight responses to the scoping were received. No significant issues were identified, and no alternatives beyond the proposed action were developed for analysis based on scoping.

The Preliminary Environmental Assessment was mailed or emailed to twenty-nine individuals or groups from an updated mailing list, August of 2010, comments were received from six individuals or groups, and are summarized and responded to in Appendix A, Response to Comments of this document.

The mailing list for the Scoping Letter, PEA, and EA are available in the project record.

Appendix A contains the Comment Response generated by the PEA. Appendix B, Summary of Public Contacts, contains a more complete list of contacts made with various individuals and groups through the life of the project. Below is a summary of main contacts.

Summary of Public Contacts:

-Oct. 14th 2006, field meeting on sight (combined w/ route designation meeting)

- April 2008, scoping mailed out to interested public

- August 23, 2010, Preliminary EA mailed out w/ cover letter to interested public

- August-September 2010, comments received from various sources

- April 16th, 2010, project was presented at Amador County Resource Conservation District meeting in Jackson, CA

- September 12th, 2011, project was presented to and discussed w/ Mokelumne River Stakeholders at Foothill Conservancy Office

-December 6, 2011, Rick Hopson (Amador DR) introduced himself to board at regular meeting, and briefly discussed Indian Valley Project, and future meeting with board

Issues

An issue is a point of debate, dispute, or disagreement regarding anticipated effects of the proposed action. Issues may be "significant" or "non-significant." Issues may be non-significant for any of four reasons: 1) the issue is outside the scope of the proposed action; 2) the issue is already decided by law, regulation, or Forest Plan; 3) the issue is irrelevant to the decision being made; or 4) the issue is conjectural and not supported by scientific or factual evidence. A significant issue is one that is not non-significant. Significant issues are used to develop reasonable alternatives to the proposed action that respond to the argument or controversy presented in the issue and substantially accomplish the purpose and need. No significant issues were identified during scoping and no alternatives developed in response to significant issues.

Alternatives

Alternative 1 - Proposed Action

The Eldorado National Forest proposes to plug and pond about 6,000 feet of a low-gradient tributary of Deer Creek in Indian Valley. Plug and pond is a process where a ponded area of water is created by plugging the stream channel with a barrier, allowing water to flow over the barrier at an elevation higher than the existing stream elevation (see attached project design, Figure 3). The plug would be partially constructed by material excavated from the upstream channel area. The work would consist of excavating 27-34 borrow areas (ponds) to construct 26-35 plugs. Plugs will be 1 to 4 feet high, which will create ponds from 1 to 4 feet deep. The meadow restoration design for the Indian Valley- Deer Creek Project has been developed remotely using surveyed cross-section data and LIDAR mapping. The actual design implementation must be accomplished in the field and will differ somewhat from the conceptual design. However, the number of features, acres affected, etc. are unlikely to change greatly, as the project has been delineated on the ground, and alteration from this plan would be in the manner of placement of plant material, and small scale changes in plug and pond dimension on the order of 1-5 feet or less per plug, with the overall footprint of the project remaining essentially the same for wetted area and acreage of disturbance.

The design assumes the existing 4-wheel drive trail in the meadow, 19E04, will remain post project. That portion of the trail , (<.25 miles), to be impacted by the restored water table would be filled/surfaced with rock back to existing meadow elevation to reduce resource damage, and would remain serviceable into the future for vehicular traffic. A geologic mudflow formation (lahar) that exists on-site may be used for the plugging material, if the clay composition is determined suitable, otherwise suitable plugging material may be brought in from offsite. Rock and large boulders would also be used as plugging material. Rock and boulders may be obtained locally, from the quarry located at Tragedy Springs quarry.

Additional road fill material would be placed in the existing stream crossings, utilized during project implementation within the meadow. Unauthorized roads and trails would have boulder barricades placed to reduce illegal use by off-road vehicles.

Portions of road 9N03 and trail 19E04 would be rocked within the current alignment to allow access for construction equipment. It may be necessary to use a temporary bridge at the first seasonal stream crossing, road 9N03, to allow construction equipment access to the meadow.

Design Criteria:

Vegetation

Vegetation removed prior to or during construction will be stockpiled, conserved by regular watering, and replanted on bare areas immediately after construction, reducing the potential for erosion from bare soil. Vegetation targeted for replanting will be limited to perennial riparian species such as willows and alders. Native sod mats may also be salvaged when possible. Willow cuttings and transplants will be placed along new flow and pond areas. Transplants should be planted immediately following construction; willow cuttings would be collected and planted in late fall or early/late spring when plants are dormant. Following construction and prior to first snow a site specific seed mix of native species would be applied to bare soils. After the initial construction revegetation may continue as needed.

Sensitive plant occurrences would be flagged and avoided during project implementation to reduce potential disturbance and extirpation from project related activities.

Any new occurrences of sensitive plant species, noxious weed, or unique habitats discovered during pre-project activities would be immediately brought to the attention of the forest botanist and appropriate mitigation measures would be implemented.

All earth-moving equipment, gravel, fill, or other materials would be weed-free. To prevent introduction of noxious weeds, equipment that has been operated in areas known to be infested with noxious weeds would be cleaned prior to entering the project area. Equipment and other materials would be considered free of soil, seeds, and other such debris after a visual inspection, by the project botanist.

Water Quality and Soil Retention

If needed, when heavy equipment is working within stream course standing water may be rerouted by pumping or diverting around the work site. Construction of plugs will start at the upstream end so that the first plug can capture any flow that is present. As construction proceeds downstream, each new plug stops the flow of water reducing the potential for sediment-laden water to leave the project area.

Onsite sand, gravel, rock, or organic matter would be used whenever possible. Vegetation removed from excavation areas would be replaced on completed plugs as soon as feasible to reduce erosion potential.

Project design and erosion control techniques (as specified by the California Regional Water Quality Control Board, Central Valley Region CRWQCB, CVR), Forest Service Best Management Practices (BMPs) and other regulatory agencies will limit the potential for sediment moving off site. Below is a summary of the BMPs that will be used on this project to limit impacts to the stream.

An Erosion Control Plan (**BMP 2.13**) that provides details regarding BMPS will be prepared prior to project implementation and followed during construction.

The proposed project will take place within the Streamside Management Zone (SMZ) along the headwaters of Deer Creek (**BMP 1.8**). The project was designed to restore the stream channel, reconnect the stream channel with its floodplain (BMP 7.2), and raise groundwater elevations (**BMP 7.3**). Construction will take place during low water and proceed from upstream to downstream. The first plug will contain flow as subsequent downstream plugs are being constructed (**BMP 2.8**). Vegetation will be removed from excavated areas, maintained, and

replaced on disturbed areas (**BMP 1.19 & 5.4**). Willows and other riparian vegetation will be planted on shorelines (**BMP 5.4**). Rock and CWD will be used as needed to armor disturbed areas (**BMP 2.3**).

Equipment will be cleaned prior to work in the SMZ. Equipment will be inspected daily for leaks or accumulations of grease. Any problems detected will be corrected prior to entering the SMZ (**BMP 2.8**). Parking and staging areas will be location outside SMZs (**BMP 2.10**). Equipment will not be fueled or serviced within the SMZ (**BMP 2.8**). Fuel and other toxic material will be stored at least 100 feet from the edge of the SMZ. A site-specific spill control plan will be available (**BMP 2.11**).

Water for vegetation maintenance and dust control will be obtained from nearby lakes (**BMP 2.5**) in accordance with procedures in the Water Quality Management Handbook.
Stream crossings in roads needed for access will be rocked or have a temporary bridge installed to reduce impacts to stream channels (**BMP 2.8**). CRWQCB, CVR and Army Corps of Engineers permits have been obtained (**BMP 2.8**).

The existing water crossing of the main channel has been rocked to reduce sediment production. The crossing would be improved by additional rocking of the area inundated by one of the ponds. This will reduce potential sediment production from Forest Service administrative use of the existing road.

All actions implemented within the floodplain of the drainage are permitted through the CRWQCB, CVR and the Army Corps of Engineers. All requirements from these agencies to stop sediment movement will be implemented as required in the permits. These requirements will ensure that implementation of these projects will meet water quality standards.

Following completion of construction activities, the job site would be returned, as much as is reasonably practical, to its original condition. Excavation and river bed disturbance would be done in the dry season (late summer to fall) whenever possible. All environmental mitigation measures stipulated by water quality permits would be implemented in a timely manner. All equipment and surplus materials would be removed from the site. Temporary culverts and/or temporary bridges would be installed to reduce or eliminate short term affects to stream crossings during implementation as needed.

Aquatic and Terrestrial Species

Should any TES species be located before or during implementation, the Amador District Biologist, and/or Forest Aquatic Biologist would be immediately notified. Protection measures/mitigations would be implemented to reduce potential for effects to TES species as recommended by biologists.

Surveys have been, and will be conducted prior to implementation of the project for willow flycatcher within and adjacent to the project area. Should species be detected, timing of implementation may be delayed or other mitigation applied to allow for completion of nesting of this species. Post project monitoring of the site will include surveys for willow flycatcher and other species.

Surveys have been, and will be conducted prior to implementation of the project for Sierra Nevada yellow-legged frogs and Yosemite toads within and adjacent to the project area. Should individuals be detected, the individuals will be moved outside the project area.

Heritage Resources:
The project's vertical Area of Potential Effect (APE) is located below archaeological site deposition. All project activities including, staging, materials storage, travel, and project implementation shall be conducted from within the stream channel to avoid impacts to archaeological deposits. . Site boundaries will be delineated with construction fence prior to project implementation. No excavation of erosion banks shall occur within flagged site boundaries. However, stabilizing materials can be placed within these areas to prevent further erosion. All project work will be monitored by a qualified archaeologist and a Native American representative during construction of plug features near 05-03-51-443. Additionally, post project monitoring shall occur to evaluate the efficacy of the project in stabilizing effects from current erosion.

Should any previously unrecorded cultural resources be encountered during implementation of this project, all work would immediately cease within 66 feet (30 meters) of the find and the District Archeologist would be notified immediately. Work may resume after approved by the District Archeologist. Should any cultural resources become damaged in unanticipated ways by activities proposed in this project, the steps described in the Sierran PA for inadvertent effects would be followed.

Should the project boundaries or activities be expanded beyond the current APE, Section 106 compliance for this project will be incomplete until additional cultural resources review is completed.

Monitoring:
Photo points (an estimated 4-6 photo points along the restoration area, may be able to utilize volunteer labor for monitoring after the initial set up) would be used to monitor the success of the project on vegetation, and habitat changes for species such as Sierra Nevada yellow-legged frogs, Yosemite toads, and willow flycatchers. Photo points would be installed prior to implementation and data would be collected at intervals after implementation.

Monitoring of the project area for willow flycatcher, other bird species, amphibians, trout, sensitive plants, and riparian vegetation will track changes in use and species presence. Monitoring of the area will occur after the project has been completed. The District Archaeologist will be kept informed of the status of various stages of the project, so that subsequent field work can proceed in a timely fashion. All subsequent inventory monitoring and site monitoring related to this project will be documented in amendments to the Heritage Resources Report, R2008-05-03-10007c, as appropriate.

Groundwater levels would be monitored pre- and post-project using existing piezometers. Project area would be monitored for noxious weeds following project completion.

Alternative 2 – No Action

No actions would be initiated for treatment of this portion of Indian Valley. Current management practices, such as dispersed camping, hiking, fire suppression, and other recreational use would continue as currently allowed within the valley.

Environmental Consequences

This section describes the environmental impacts of the proposal in relation to whether there may be significant environmental effects as described at 40 CFR 1508.27. Further analysis and conclusions about the potential effects are available in resource specialist reports and other supporting documentation located in the project record. The following are discussions of resources that have relevance to a determination of significance.

Management Indicator Species:

Alternative 1- Proposed Action

Management Indicator species are analyzed in the Management Indicator Species report for this project (Loffland and Williams 2010), and effects for these species are summarized here. There are two MIS habitat types and species which would be either directly or indirectly affected by the project, aquatic macro-invertebrates (lacustrine and riverine habitats), and Pacific tree frogs (wet meadow).

Lacustrine/Riverine Habitat (Aquatic Macroinvertebrates)

Direct and Indirect Effects

The direct and indirect effects to aquatic macroinvertebrates that are considered pertain to shade, flow, and sedimentation. Heavy equipment use during pond construction will increase sedimentation during the low flow period of construction of the ponds. This sediment should occur primarily over the first year, and be greatly reduced in years after that. The creation of the ponds would have a beneficial effect over the long term to aquatic macroinvertebrates by increasing water storage in the meadow, thus cause higher flows for a longer duration over the summer. Shade over the stream is expected to increase over time from planting willow cuttings. Willows will also provide bank stability, which also helps reduce sedimentation.

Cumulative Effects

The cumulative effects analysis presented here for aquatic macroinvertebrates considers the effects of this project when combined with past, present, and foreseeable future actions and events. Past land disturbances within the proposed project area were considered if they had the potential to influence species population dynamics and/or potential habitat. Similarly, future land disturbances were considered based on their probability of influencing species populations and/or aquatic community components. Due to the uncertainty regarding future anthropogenic disturbance in the affected watershed, the temporal scale for this analysis is limited to approximately 5 years.

The degraded condition of Indian Valley is as a result of past grazing by cattle and sheep, water diversions and ditching, and user-created roads and trails. The state of the meadow today is a result of all of the above past activities and natural processes. It is difficult, if not impossible, to assign certain past actions to either an amount of damage, or an entire area of damage as these past activities have worked in a cumulative manner over time.

Combining this project with cumulative effects from past and foreseeable future effects to these streams, the effects of this project are very minor. If this project were not completed, the effects would be much larger from continued sediment over years to come. Any sedimentation from this project is expected to be short-term and to not cause more than the first season of a mild deposit on river substrates below the crossings. Over time, shade, flow, and sedimentation will be improved.

Wet Meadow Habitat (Pacific tree frog)

Direct and Indirect Effects
The project would be expected to increase storage of snowmelt groundwater (baseflow) for late summer wetting of meadow vegetation, thus improving habitat for these aquatic species, and release water downstream at higher levels later in the season than at the present time. The ambient temperature of 500 acres of meadow is expected to be lowered by approximately 3 degrees C (Loheide and Gorlick 2006), and probably double the evapotranspiration rates as a result of increased surface water (Loheide and Gorlick 2005; Waring and Schlesinger, 1985). The analysis area for the project is the Upper Deer Creek 7th field watershed.

Cumulative Effects
Cumulative effects to Pacific tree frog habitat from electro-shocking efforts would be related to the capture and removal of predatory trout. Specifically, the removal of trout would be expected to enhance reproductive success, facilitate population expansion, and promote recolonization of Pacific tree frog populations. Trout are known predators on frog life stages (Knapp and Matthews 2000).

Indian Valley has been affected by past grazing by cattle and sheep, water diversions and ditching, and user-created roads and trails. These have caused stream channel erosion with gullying and headcutting, lowering of the ground water table in the meadow, drying of the meadow vegetation, loss of willows, sagebrush encroachment, and sedimentation in the stream channel. Recreational users driving in the valley area have contributed to meadow degradation and stream channel downcutting . As a result of stream downcutting and drying of the meadow at Indian Valley, wildlife habitat has been degraded, including habitat for vulnerable sensitive amphibian species. The original creation of the diversion at the head of the meadow likely reduced the water flow into the meadow.

Of the 5,156 total acres in the Upper Deer Creek watershed, 500 acres of improvements from rewetting the meadow improves water storage and raises the groundwater level in 10% of the watershed. The habitat condition from restoration of past cumulative impacts on Indian Valley would be trending upward.

Alternative 2- No Action

Direct, Indirect and Cumulative Effects
As no activities are planned under this alternative, there would be no change in direct or indirect effects, and therefore no cumulative effects for any species listed in the MIS report.

Terrestrial Wildlife Species (Threatened, Endangered, and Sensitive Species): Alternative 1- Proposed Action

Affects to terrestrial wildlife species are analyzed in the Biological Evaluation and Assessment for this project (Loffland 2010), and summarized here. Based on current literature for the terrestrial Threatened, Endangered, and Sensitive wildlife species, several would not be affected by the proposed project. Table 1.0 identifies these species which will not be receiving further analysis in this document.

Table 1.0: Species Not Affected by the Proposed Project

Species	Reason for No Effect/Impact Determination
valley elderberry longhorn beetle California spotted owl western red bat Pacific fisher	The project does not occur within the known or suspected range of the species (elevation range).
bald eagle peregrine falcon California wolverine American marten northern goshawk pallid bat Townsend's big-eared bat	The project area does not include suitable habitat for the species; habitat occurring adjacent to the project will not be affected.

Suitable habitat for these species does not occur within the project areas and/or it is not expected that the project will generate any direct, indirect, or cumulative impacts to the species or its habitats. No further analysis will occur for these species.

Great Gray Owl

Direct and Indirect Effects

Direct effects are limited to the area that currently is suitable for great gray owl nesting or foraging. Suitable habitat within the project area is suitable foraging habitat, there is no nesting habitat within the project area which would be affected as the proposed restoration would treat the stream channel and immediately adjacent areas which do not support nesting trees and snags and associated habitat. Effects to the foraging habitat would be in the form of soil movement and reduced initial vegetation and the plugs and ponds are formed. Revegetation of this area is expected to be rapid, in previous projects on the Tahoe National Forest, treated areas revegetated to similar or higher levels in one season. The effect on great gray owl prey from this short term loss of vegetation should be minimal, as there is ample other meadow vegetation in close proximity to provide prey during this short period. Prey density may increase as the treated stream channel and surrounding vegetation responds to the increased water table and associated changes to vegetation.

Project activities would likely take place toward the end, or after the nesting season for great gray owls. Noise disturbance resulting from the equipment used in the restoration process would take place outside of any potential nesting locations. The fact that project activity would take place within foraging habitat, and the timing of the activity, during the day, make it highly unlikely that nesting disturbance, would take place. Foraging behavior would be unlikely to be affected, as the majority of the foraging for great gray owls is nocturnal when project activities would not be taking place. If disturbance did occur, temporary displacement of individuals could occur, but would not be expected to affect reproduction. As there are presently no known occupancy of this area by this species, project timing, and due to the location of project activity outside of nesting habitat no LOP is believed to be needed to protect great gray owl reproduction. Should this species be detected, prior to or during implementation of the project, a limited operating period (LOP) March 1 to August 15th and other mitigation would be considered as appropriate at that time.

Cumulative Effects
Analysis of cumulative effects to great gray owl will consider the impacts of the proposed action when combined with past, present, and foreseeable future actions and events that have affected or may affect the quantity or quality of great gray owl habitat. The cumulative effects analysis area has been established as the Indian Valley Area, including the meadow, and surrounding forested area. The geographic scope of the cumulative effects analysis was selected considering the area that would likely be utilized if a great gray owl is present in this area. The actions contributing to cumulative effects are those past and future actions, which have affected or will affect the quantity or quality of habitat within this analysis area. Within the cumulative affects area past fire suppression, grazing and related management, recreational use, and road and trail development and use, have altered the quantity and quality of great gray owl habitat. The cumulative effect has been a lowering of the water table within portions of the meadow, stream down cutting, and changes in vegetation.

Foreseeable actions affecting the quantity, quality or development of great gray owl habitat in the cumulative effects analysis area are: presently the main road/trail that bisects much of the meadow is closed to public vehicle use, this may be revisited in the near future, beyond this change there are no known foreseeable actions within the cumulative affects area.
The proposed action would not be expected to contribute to past reductions/degradation in the amount or quality of suitable great gray owl habitat. The project at worst would be neutral in effect, and is expected to improve habitat quality if not quantity for this species. Great gray owl sites are not currently well distributed across the cumulative effects analysis area, the Amador Ranger District, or the Eldorado National Forest, the extent to whether this is related to population or habitat gaps is not known.

Willow Flycatcher

Direct and Indirect Effects
Nesting willow flycatchers have been detected within Indian Valley, and at Wet Meadows reservoir nearby to the project area. No willow flycatchers have been detected within the area directly affected by the project, surveys have taken place and the species was detected in 2009 adjacent to the project area, surveys are continuing in 2010, to date the species has not been detected within or adjacent to the project area. Surveys will take place during breeding season before the project would be implemented.

Direct effects are limited to the area that currently provides suitable habitat for northern willow flycatcher nesting or foraging. Presently the area proposed for treatment is not believed to provide high capability habitat due to the downcut stream and little standing water to provide insect prey for foraging.

Direct effects associated with the proposed action would result from habitat alteration from disturbance to existing vegetation, for this species effects to willow would be especially important as most nesting takes place within willow associated with meadow/riparian areas.
The proposed plug and pond generation would affect existing willow along the stream channel. In some cases there would likely be some temporary loss of willow, or damage to existing willow clumps where they are moved, crushed or removed. Should the species be present and utilizing this area at the time of project implementation, nests could be damaged or lost due to direct affects to the willow used for nest locations. This is unlikely to occur, as activities would take place late in the nesting season after birds have fledged, and surveys would be conducted to

determine occupancy prior to implementation. Should nesting be determined mitigation of effects through avoidance of the nesting area and/or waiting until after nesting and fledging has taken place would be used to reduce potential for affects to reproduction from that breeding season. These reductions in willow vigor and biomass would be short term, with the increased water table willow habitat would be expected to expand in size and vigor in the years following the project, potentially improve habitat capability and increasing the potential for this area and surrounding habitat to be utilized by this species for nesting.

Project activities would likely take place toward the end, or after the nesting season for willow flycatcher. Noise disturbance, and potential direct affects to the nest as described above, are unlikely due to design features of the surveys, and change in timing of project activities to accommodate reproduction of willow. Foraging behavior would be unlikely to be affected, as the majority of the foraging for this species is in proximity to the nest, and with surveys these affects would be mitigated as described for direct affects to nesting through changes in timing or avoidance of areas earlier in the breeding cycle. Should foraging behavior be affected, temporary displacement of individuals could occur, but reproduction would be unlikely to be affected. As there are presently no known occupancy of this area by this species, no LOP is believed to be needed to protect willow flycatcher reproduction. Should this species be detected, prior to or during implementation of the project, a limited operating period and other mitigation would be considered as appropriate at that time.

Cumulative Effects
Analysis of cumulative effects to willow flycatcher considers the impacts of this alternative when combined with past, present, and foreseeable future actions and events that have affected or may affect the quantity or quality of willow flycatcher habitat. The cumulative effects analysis area has been established as the Indian Valley Area, including the meadow, and surrounding forested area. The geographic scope of the cumulative effects analysis was selected considering the area that has been used, and would likely be utilized if willow flycatchers are present in this area. The actions contributing to cumulative effects are those past and future actions, which have affected or will affect the quantity or quality of habitat within this analysis area. Within the cumulative affects area past fire suppression, grazing and related management, recreational use, road and trail development have altered the quantity and quality of willow flycatcher habitat. The cumulative effect has been a lowering of the water table within portions of the meadow, stream down cutting, changes in vegetation (in particular willow), and reduced ponding/stagnant areas of the stream.

Foreseeable actions affecting the quantity, quality or development of willow flycatcher habitat in the cumulative effects analysis area are: presently the main road/trail that bisects much of the meadow is closed to public vehicle use, this may be revisited in the near future, beyond this change there are no known foreseeable actions within the cumulative affects area.
The proposed action would not be expected to contribute to past reductions/degradation in the amount or quality of suitable willow flycatcher habitat. The project at worst would be neutral in effect, and is expected to improve habitat quality if not quantity for this species. Willow flycatcher are not currently well distributed across the cumulative effects analysis area, the Amador Ranger District, or the Eldorado National Forest, the extent to whether this is related to population, habitat loss, or habitat gaps is not known..

Alternative 2- No Action

Direct, Indirect and Cumulative Effects

As no activities are planned under this alternative, there would be no change in direct or indirect effects, and therefore no cumulative effects for any terrestrial TES species. Habitat for these species, where it exists, would remain in the same condition, and be acted upon by the same forces as it presently is.

Aquatic TES Species:

Affects to aquatic wildlife species are analyzed in the Biological Evaluation and Assessment for this project (Williams 2010), and the supplement/review to the BE/BA (Williams 2012), and are summarized here. Based on current literature for the aquatic Threatened, Endangered, and Sensitive wildlife species, several would not be affected by the proposed project. Table 2.0 identifies these species which will not be receiving further analysis in this document.

Table 1 lists the species introduced in Section II, their preferred habitats, and whether, based on the activities the project proposes, the species has the potential of being adversely affected by the proposed Indian Valley Restoration Project. Species that may be affected by the activities proposed under this project are in **bold type.**

Table 2.0. Threatened or endangered aquatic species that may be present in Eldorado National Forest, their preferred habitat and elevation range, and their potential to reside in the analysis area for the Indian Valley Restoration Project.

Species	TES Status	Elevation Range of Habitat	Preferred Habitat	Potential for Alternative 1 to Affect this Species
California red-legged frog and proposed critical habitat	threatened	Below 1,525 m (5,000 ft)	Ponds and slow-moving streams	None. Outside the species' elevational range.
Central Valley spring-run Chinook salmon	threatened	N/A	Central Valley delta and up rivers to man-made and natural barriers	None. Design Criteria and BMPs will prevent adverse effects downstream.
Central Valley steelhead	threatened	N/A	Central Valley delta and up rivers to man-made and natural barriers	None. Design Criteria and BMPs will prevent adverse effects downstream.
delta smelt	threatened	N/A	Sacramento-San Joaquin delta	None. Design Criteria and BMPs will prevent adverse effects downstream.
foothill yellow-legged frog	FS sensitive	Below 1,830 m (6,000 ft)	High gradient streams with cobbles, riffles, and open areas	None. Outside the species' elevational range.
hardhead	FS sensitive	9-1,465 m (30-4,800 ft)	Sacramento-San Joaquin delta, S. Fork American River	None. Design Criteria and BMPs will prevent adverse effects downstream.
Lahontan cutthroat trout	threatened	N/A	High elevation and east slope streams and lakes	None. No known populations have the potential to be affected by the proposed project.
Sierra Nevada yellow-legged frog	**FS sensitive**	**Above 1,525 m (5,000 ft)**	**High elevation low-gradient streams and small ponds**	**Suitable habitat and known populations exist within the project area.**
northern leopard frog	FS sensitive	From sea level-2,135 m (7,000 ft)	Perennial streams and ponds	None. Incidental historical occurrence for this species on Forest at Riverton and off-Forest in the Lake Tahoe Basin.

Species	TES Status	Elevation Range of Habitat	Preferred Habitat	Potential for Alternative 1 to Affect this Species
western pond turtle	FS sensitive	Below 1,525 m (5,000 ft)	Ponds and slow moving streams	None. Outside the species' elevational range.
winter-run chinook salmon	endangered	N/A	Central Valley delta and up rivers to man-made and natural barriers	None. Design Criteria and BMPs will prevent adverse effects downstream.
Yosemite toad	**FS sensitive**	**Above 1,950 m (6,400 ft)**	**High elevation wetland areas and meadows**	**Suitable habitat and known populations of Bufo spp. exist within the project area.**

Sierra Nevada Yellow-legged Frog

Alternative 1- Proposed Action

Direct and Indirect Effects

The analysis area for the project is 0.8 miles of the Upper Deer Creek 7th field watershed. As the project would not remove the existing trout within the project area; the project would maintain the status quo of existing habitat conditions at Indian Valley for Sierra Nevada yellow-legged frogs. By implementing this project, additional niches of shallow water edges and ponds will result because of the increase in habitat complexity. The creation of the pools would have a beneficial effect to Sierra Nevada yellow-legged frogs by providing them deeper water for escape cover, boulders for basking platforms, and warm shallow edges for tadpole maturation. The riparian zone will be planted with willows to provide bank stability and escape cover.At these additional habitat areas, such as shallow edges or isolated ponds where trout do not reside, it is possible that Sierra Nevada yellow-legged frogs may increase somewhat.

Direct effects to Sierra Nevada yellow-legged frogs from heavy equipment use during the creation of the pools is possible, although unlikely. This could involve crushing of adults or burying them under soil, fill, gravel, or large woody debris. The tributary stream will be surveyed for aquatic species prior to entering the location and any life stage of Sierra Nevada yellow-legged frogs will be moved out of harm's way. If any are moved, this removal from their immediate habitat area to another site may affect individuals.

Cumulative Effects

Recreational users in the valley area may have caused harassment to the various life stages of Sierra Nevada yellow-legged frogs by camping in and near their habitat, or allowing dogs to run in the area. Harassment could occur by handling the larvae and adults, disturbing adults while basking, or using tadpoles for fishing bait.

Indian Valley has been affected by past grazing by cattle and sheep, water diversions and ditching, and user-created roads and trails. These have caused stream channel erosion with gullying and headcutting, lowering of the ground water table in the meadow, drying of the meadow vegetation, loss of willows, sagebrush encroachment, and sedimentation in the stream channel. As a result of stream down-cutting and drying of the meadow at Indian Valley, wildlife habitat has been degraded, including habitat for vulnerable sensitive amphibian species. The original creation of the diversion at the head of the meadow may have affected existing Sierra

Nevada yellow-legged frog populations. This diversion likely reduced the water flow into the meadow.

Other possible affects to Sierra Nevada yellow-legged frogs in the Sierra Nevada high mountain lakes and pools are exposure to pesticides (Sparling et al. 2001). Fellers et al. (2004) provided data on the concentrations of pesticide residues in frogs from two sites in the Sierra Nevada mountains and adds support to the idea that pesticide drift from the Central Valley of California is a "significant contributing factor in Sierran amphibian declines".

Additional reasons for the frog's disappearance that have been offered include: increased ultraviolet radiation, viruses, acid rain, and disease. Chytrid fungus has been found to be affecting frogs worldwide, and in particular, the Sierra Nevada yellow-legged frog. It is suspected that factors such as ultraviolet radiation, global warming, and acid rain may be synergistically reducing the immune system of frogs and making them more susceptible to disease.

The viability of Sierra Nevada yellow-legged frogs throughout its range on the Eldorado National Forest is not expected to be adversely affected by this project. There are healthy and prosperous populations of Sierra Nevada yellow-legged frogs nearby at Tamarack Lake and Little Indian Valley, for instance, which may repopulate Indian Valley from dispersing adult Sierra Nevada yellow-legged frogs.

Alternative 2- No Action

Direct and Indirect Effects
No actions would be initiated for meadow treatment of this portion of Indian Valley. The beneficial effects from meadow restoration to Sierra Nevada yellow-legged frogs would not occur, including: the pools would not be created thus leaving less available pool habitat, few boulders basking sites resulting with less habitat complexity, less productive riparian zone that would have provided bank stability and escape cover, and trout would continue to reside in the stream, reducing available stream habitat and predating on individual Sierra Nevada yellow-legged frogs.

Cumulative Effects
Cumulatively, leaving trout in this tributary to Deer Creek would continue to reduce Sierra Nevada yellow-legged frog life stages over time. Trout are known predators on Sierra Nevada yellow-legged frog life stages (Knapp and Matthews 2000).

All other cumulative effects are applicable to this choice of no action. By not implementing the proposed action, stream degradation would continue and the lowered water table would remain as it is now.

Yosemite Toad

Alternative 1- Proposed Action

Direct and Indirect Effects
The analysis area for the project is 0.8 miles of the Upper Deer Creek 7th field watershed. Direct effects to Yosemite toads from heavy equipment use during the creation of the pools is possible. This could involve crushing of adults or burying them under soil, fill, gravel, or large woody debris. Since toads have been known to reside in mammal holes, they could be moved by heavy

equipment during pool creation and probably crushed. The tributary stream will be surveyed for aquatic species prior to entering the location and any life stage of Yosemite toads will be moved out of harm's way. If any are moved, this removal from their immediate habitat area to another site may affect them also.

Yosemite toads are not impacted by the presence of trout, as they are not known to be consumed by trout. The creation of the pools would have a beneficial effect to Yosemite toads by raising the water table in the meadow and providing increased shallow stream edges of pools for tadpole maturation. Moist meadow area will increase, thus meadow habitat with burrows for Yosemite toad escape cover will also increase. The riparian zone will be planted with willows to provide bank stability and escape cover for tadpoles and adults.

Cumulative Effects
Indian Valley has been affected by past grazing by cattle and sheep, water diversions and ditching, and user-created roads and trails. These have caused stream channel erosion with gullying and headcutting, lowering of the ground water table in the meadow, drying of the meadow vegetation, loss of willows, sagebrush encroachment, and sedimentation in the stream channel. As a result of stream down-cutting and drying of the meadow at Indian Valley, wildlife habitat has been degraded, including habitat for vulnerable sensitive amphibian species. The original creation of the diversion at the head of the meadow may have affected existing Yosemite toad populations. This diversion likely reduced the water flow into the meadow.

Recreational users in the valley area may have caused harassment to the various life stages of Yosemite toads by camping in and near their habitat, or allowing dogs to run in the area. Harassment could occur by handling the larvae and adults, disturbing adults while basking, or using tadpoles for fishing bait.

Other possible affects to Yosemite toad in the Sierra Nevada high mountain lakes and pools are exposure to pesticides (Sparling et al. 2001). Fellers et al. (2004) provided data on the concentrations of pesticide residues in frogs from two sites in the Sierra Nevada and adds support to the idea that pesticide drift from the Central Valley of California is a "significant contributing factor in Sierran amphibian declines".

Additional reasons for the toad's disappearance that have been offered include: increased ultraviolet radiation, viruses, acid rain, and disease. It is suspected that factors such as ultraviolet radiation, global warming, and acid rain may be synergistically reducing the immune system of toads and making them more susceptible to disease.

Yosemite toads are not palatable to stocked brook trout (Grasso et al. 2005), therefore the stocking of trout that can affect Sierra Nevada yellow-legged frog life stages would not affect Yosemite toad life stages.

Alternative 2- No Action

Direct and Indirect Effects
No actions would be initiated for meadow treatment of this portion of Indian Valley. The beneficial effects to Yosemite toads by the proposed project would not occur, including: the pools would not be created, thus leaving less available reproductive habitat at the shallow pool edges, less productive riparian zone would continue that would have provided bank stability and escape

cover, and the water table would remain the same with a continued reduction of moist riparian meadow areas.

Potential effects of disturbance by heavy machinery would not occur.

Cumulative Effects
Cumulative effects above are applicable to no action. By no action, stream degradation would continue and the lowered water table would remain as it is now or potentially continue to downcut and degrade stream habitat over time.

Heritage Resources:

Heritage Resources potentially affected by the proposed action were analyzed in the Heritage Resource Report for Indian Valley (Connolly 2008 [amended by Whiteman 2012]), the report is summarized below.

Resources at Risk: Heritage resources within Indian Valley include prehistoric habitation sites and an historic barn. Resources at risk include one prehistoric habitation site which may be affected by the following anticipated project activities; construction of plugs along a tributary of Deer Creek to restore the streamside habitat and meadow.

Cultural Resources in Project Area or Vicinity: The following table 3.0 highlights the cultural resources within the project area or in the immediate vicinity.

Table 3.0

FS No. 05-03-51-	P, H, P/H	RAR for project activity	Resource Type	Comments
443	P	Y	Prehistoric Habitation Site	Adjacent to Northern project area – Within Area of Potential Effect.
440	H	N	Historic Barn and historic debris	Outside of Area of Potential Effect.
458	P	Y	Extensive Lithic Scatter	Outside of Area of Potential Effect.

Note: P = prehistoric, H = historic, RAR = Resource at Risk

Alternative 1- Proposed Action

Direct and Indirect Effects
Through implementation of the design criteria developed to protect cultural recourses, there will be no adverse effect to heritage resources. Implementation of the proposed action will stabilize the cut bank below the archaeological site, providing some protection from erosion within the Deer Creek Tributary channel. Although the project would retain trail 19E04 as an intact road/trail, other non-system routes near the project may become impassable, due to increased saturation of the soils. This would limit motorized access to archeological sites, not directly adjacent to trail 19E04, which may prevent further degradation of site components. Implementation of this alternative has the potential to restore the meadow to a state that is closer to the original setting and feeling during Native American occupation of the Valley (Whiteman 2012, p.3).

Cumulative Effects
Past grazing, camping, OHV activity, stream down cutting, historic homesteading, and meadow degradation have all contributed to the erosion and impacts to archaeological resources in the area. These effects occur as artifact collecting, trampling, erosion, and deflation from vehicle travel. Implementation of Alternative 1 is likely to stabilize or improve the condition of these resources.

Alternative 2- No Action

Direct and Indirect Effects
There would be no new direct impacts to cultural resources from the No Action Alternative. The No Action Alternative would allow continued erosion to occur within the valley and contribute to site instability.

Cumulative Effects
Past grazing, camping, OHV activity, stream down cutting, historic homesteading, and meadow degradation have all contributed to the erosion and impacts to archaeological resources in the area. These effects occur as artifact collecting, trampling, erosion, and deflation from vehicle travel. The No Action Alternative will cause no change in these conditions.

Botanical Resources and Sensitive Plants:

Alternative 1- Proposed Action

A more complete analysis of sensitive plants, and other botanical resources is contained in the Biological Evaluation for Sensitive Plants for the Indian Valley Meadow Restoration Project (Brown 2010, and reviewed/supplemented 2012) and is summarized below.

A botanical survey for rare plants, unique habitats, and noxious weeds were completed in 2006. There are no known occurrences of sensitive species within the project area.

For Listed Species
It is the determination of the forest botanist that the Indian Valley Meadow Restoration Project would not affect *Packera layneae*.

For Sensitive Species
It is the determination of the forest botanist that the Indian Valley Meadow Restoration Project would have no effect on *Allium tribracteatum, Arctostaphylos nissenana, Balsamorhiza macrolepis var. macrolepis, Calochortus clavatus var. avius, Clarkia biloba ssp. brandegeeae Cypripedium montanum, Draba asterophora var. asterophora, Draba asterophora var. macrocarpa, Eriogonum tripodum, Horkelia parryi, Lewisia kelloggii ssp. hutchinsonii, Lewisia kelloggii ssp. kelloggii, Lewisia longipetala, Lewisia serrata, Navarretia prolifera ssp. lutea,* or *Phacelia stebbinsii.*

It is the determination of the project botanist that the Indian Valley Meadow Restoration Project may affect undiscovered individuals, but will not lead to a trend towards federal listing for *Botrychium spp.* (*B. ascendens, B. crenulatum, B. lunaria, B. minganense, B. montanum, and B. paradoxum*), *Bruchia bolanderi, Epilobium howellii, Helodium blandowii, Meesia triquetra, Meesia uliginosa, Peltigera hydrothyria,* and *Pinus albculius.*

Hydrology:

The complete analysis of hydrologic resource and effects is contained in the Draft Hydrology Specialist Report for the Indian Valley Meadow Restoration Project (Bakker, 2012) and is summarized below.

Alternative 1- Proposed Action

Direct and Indirect Effects
Plugging and ponding creates a large physical disturbance to the immediate stream channel zone. Vegetation would be removed prior to excavation and kept moist to be used on the new plug surfaces. Willows and willow cuttings would be planted around the new pond areas. Revegetation of bare soil would be implemented immediately after construction. In most places the stream flow is directed away from exposed soil in the entrenched stream banks, reducing sediment production. In some instances the flow will be through the pond, over or next to the constructed plugs. Construction of plugs will start at the upstream end so that the first plug can capture any flow that is present. As construction proceeds downstream, each new plug stops the flow of water reducing the potential for sediment-laden water to leave the project area.

There is a potential to have a small, short term input of sediment to the stream during construction. Project design and erosion control techniques (as specified by the CRWQCB, CVR), Forest Service BMPs and other regulatory agencies) will limit the potential for sediment moving off site. During most water years, the flow in the stream within Indian Valley is intermittent during the late summer when the project would be implemented. Excess turbidity and sedimentation is not expected to be carried downstream outside of the project area because of the intermittent flow characteristics of the channel, although some turbidity may occur downstream, depending on the flow in the channel. This turbidity would only be temporary, and in the long term this project is expected to improve watershed condition.

All actions implemented within the floodplain of the drainage will be permitted through the CRWQCB, CVR and the Army Corps of Engineers. All requirements from these agencies to stop sediment movement will be implemented as required in the permits. These requirements will ensure that implementation of these projects will meet water quality standards.
The existing water crossing of the main channel has been rocked to reduce sediment production. The crossing would be improved by additional rocking of the area inundated by one of the ponds. This will reduce potential sediment production from public and Forest Service use of the existing road.

The final result of this treatment will be a stream that can access the floodplain, spread out and reduce the energy of the water flow and re-water the nearby meadows. The seasonal water table is expected to stay higher for longer into the dry season, encouraging the growth of riparian vegetation, and moderating potential flood flows. The result is a much healthier meadow system and watershed.

Potential sedimentation effects will be minimized by conducting the work during low or no flow conditions and by starting at the upstream end of the restoration area. Starting at the upstream end allows the first plug to hold any flow in the channel until the next plug can be constructed, thus blocking flow through the work area. Vegetation removed prior to or during construction will be stockpiled, conserved by regular watering, and replanted on bare areas immediately after

construction, reducing the potential for erosion from bare soil. Willows will be replanted and willow cuttings will be placed along new flow and pond areas.
All actions implemented within the floodplain of the drainage will be permitted through the CRWQCB, CVR and the Army Corps of Engineers. All requirements from these agencies to stop sediment movement will be implemented as required in the permits. These requirements will ensure that implementation of these projects will meet water quality standards.

By ensuring that implemented BMPs, as described below, and other project requirements are focused on the maintenance of water quality and keeping soil in place, sediment movement would be controlled and remain within limits that meet water quality requirements of the primary regulatory agencies. It is therefore concluded that there would be no irreversible or irretrievable water quality impacts from the proposed treatments and the requirements for the maintenance of water quality as established by the CRWQCB, CVR and the federal Clean Water Act would be met.

BMPs

Below is a summary of the BMPs that will be used on this project to limit impacts to the stream.. An Erosion Control Plan (BMP 2.13) that provides details regarding BMPS will be prepared prior to project implementation and followed during construction.

The proposed project will take place within the Streamside Management Zone (SMZ) along the headwaters of Deer Creek (BMP 1.8). The project was designed to restore the stream channel, reconnect the stream channel with its floodplain (BMP 7.2), and raise groundwater elevations (BMP 7.3). Construction will take place during low water and proceed from upstream to downstream. The first plug will contain flow as subsequent downstream plugs are being constructed (BMP 2.8). Vegetation will be removed from excavated areas, maintained, and replaced on disturbed areas (BMP 1.19 & 5.4). Willows and other riparian vegetation will be planted on shorelines (BMP 5.4). Rock and CWD will be used as needed to armor disturbed areas (BMP 2.3).

Equipment will be cleaned prior to work in the SMZ. Equipment will be inspected daily for leaks or accumulations of grease. Any problems detected will be corrected prior to entering the SMZ (BMP 2.8). Parking and staging areas will be location outside SMZs (BMP 2.10). Equipment will not be fueled or serviced within the SMZ (BMP 2.8). Fuel and other toxic material will be stored at least 100 feet from the edge of the SMZ. A site-specific spill control plan will be available (BMP 2.11).

Water for vegetation maintenance and dust control will be obtained from nearby lakes (BMP 2.5) in accordance with procedures in the Water Quality Management Handbook.

Stream crossings in roads needed for access will be rocked or have a temporary bridge installed to reduce impacts to stream channels (BMP 2.8). CRWQCB, CVR and Army Corps of Engineers permits have been obtained (BMP 2.8).

Cumulative Effects
The project area is in a remote location and has only the currently planned restoration project and the potential for closure of the existing user-created roads as proposed projects. It is anticipated that the roads in the valley will remain open, and that stream crossings or floodplain crossings that are affected by the proposed action will be rocked to reduce sediment production. Closing and/or rocking the roads would result in minor, long-term, beneficial effects to the stream by reducing sediment production.

The proposed action would result in short-term, local adverse effects during construction due to construction equipment working in the stream channel, causing soil disturbance and potentially generating sediments. Mitigation measures including working during low or no flow conditions, starting up stream so that newly constructed plugs can block water flow, and implementing CRWQCB, CVR and Army Corps of Engineers water quality protection requirements will keep adverse effects to a minimum.

The project will have long-term, local, beneficial effects on the stream channel, associated riparian areas, and portions of the meadow. Stream flow will be moderated, groundwater storage will increase, and mesic meadow habitat will be restored.

Alternative 2- No Action

In the No Action Alternative, the pond and plug system would not be constructed and the valley would remain as it currently is; mostly dry meadow with incised stream channels and user created roads generating sediments to the streams during flow events. Stream channels could continue to incise, dewatering the meadows further and encouraging sagebrush encroachment. Riparian habitat would remain the same or decrease.

Direct and Indirect Effects
Current direct and indirect effects of the user created roads include diverting surface and shallow groundwater to the roadway, causing erosion and sediment transport to stream channels. Use of roads during wet conditions creates rutting, which increases water diversion and erosion. Increased sediment in stream channels increases turbidity and reduces water quality.

Continued presence of incised stream channels keeps the groundwater table low maintaining and increasing dry meadow areas and allowing sagebrush encroachment.
The valley would remain in a hydrologically degraded condition resulting in long-term, local, adverse effects.

Closure of the user created roads could reduce sediment generation and transport to the streams. If the roads remain open, maintenance or improvement of stream crossings would also improve water quality by reducing sediment generation.

Cumulative Effects
If the stream restoration project is not conducted, the roads remain open and stream crossings unimproved; there would be no cumulative effects from other projects.

The No Action Alternative would result in conditions staying substantially the same or becoming gradually more degraded. There is potential for additional channel incision, streambank erosion, meadow dewatering, and sediment generation within the incised stream channels.

Soils and Geology:

Alternative 1- Proposed Action

The proposed action would remove soil and rock from some areas to create plugs. This would result in negligible soil loss during construction of plugs as small volumes of sediments enter the stream. The long-term effects would be beneficial as the higher water table and increased mesic vegetation improve soil condition and fertility.
The proposed action would work with surface soils in the vicinity of the stream channel only and would have no effects on local geology.

Alternative 2- No Action

There are no treatments or activities planned that would directly affect soils within the project area.

Recreation:

Alternative 1- Proposed Action

The proposed action would not change status of any of the recreational use of the Indian Valley area. Camping, hiking, hunting would not be affected by the plug and pond portion of the project.

Alternative 2- No Action

There are no treatments or activities planned that would directly affect recreational resources within the project area.

Figure 1

Indian Valley Restoration Project Area

Figure 2

Indian Valley Restoration Project Design